

Amendment
Application No. 10/804,179
Attorney Docket No. 042256

REMARKS

Claims 1 and 3-23 are pending in this application, of which claims 1, 18 and 19 have been amended. No new claims have been added.

The amendment has substantially incorporated the limitations of original claim 2 into the independent claims. The amendment does not necessitate new search. Thus, even if the Examiner rejects the claims by new reasons, the Applicants request a non-final rejection.

(1) Claims 1, 18 and 19 were rejected under 35 U.S.C. §102(b) as being anticipated by Yang et al. (U.S.P. 4,654,295). Claims 2, 3, 10-17, 20, 22 and 23 were also rejected under 35 U.S.C. §103(a) as being unpatentable over Yang et al. in view of Nozaki et al. (WO 03014830).

(i) The Applicants disagree with the 102(b) rejection because the method disclosed by Yang et al. is completely different from the invention recited in claims 1, 18, 19, as explained below. However, claims 1, 18 and 19 have been amended to incorporate the limitation of claim 2, so that the 102(b) rejection has made moot.

(ii) In the present invention, the opening is formed in the photoresist film. The hydrophilicity and affinity with a chemical liquid is increased at the sidewall, in the upward direction of the sidewall. The chemical liquid is reacted with the photoresist film having the opening to swell the sidewall so as to reverse-taper the sidewall of the opening. In the present

invention, because hydrophilicity and affinity with a chemical liquid is upward increased at the sidewall, the swelling amount becomes larger as the sidewall goes upward. Thus, the opening of the photoresist film can be reverse-tapered. In the present invention, the photoresist film is swollen after the development of the photoresist because the opening in the present invention is formed by the development of the photoresist.

On the other hand, Yang's photoresist is swollen with a solvent before the development of the photoresist. Before the development, no opening is formed in the photoresist. After See, e.g., column 5, lines 28-39. Also, as disclosed at col. 7, lines 18-28, the photoresist is swollen with a solvent, and then developed, thereby forming an opening or resist pattern. Because Yang's photoresist is swollen with a solvent before the development of the photoresist, the Yang's "swelling" is completely different from the present invention. There is no opening and no sidewall to be swollen by the solvent in Yang et al. Yang's solvent is not contacted with a resist pattern, or opening in the resist film. Also, Yang et al. do not utilize the hydrophilicity and the affinity of the solvent with the developed photoresist. Also, Yang et al. do not form the reverse-tapered photoresist, by using the variation of the hydrophilicity and affinity the sidewall of the opening of the photoresist film. Yang et al. do not teach changing the hydrophilicity and the affinity of the photoresist in the upward direction of the sidewall of the opening. Thus, the method taught by Yang et al. is completely different from the claimed method, and one skilled in the art is not motivated to modify the Yang's teaching into the present invention.

Moreover, the Examiner relies on page 7, lines 6-12 of Nozaki et al. The Examiner states that Nozaki et al. teach a method of forming a photoresist film, the opening having hydrophilicity and the affinity with the chemical liquid. However, because Nozaki et al. do not teach the sidewall of the opening of the photoresist film having hydrophilicity and affinity increased in the upward direction of the sidewall, the teaching of Nozaki et al. do not form any reverse-tapered photoresist film.

Thus, neither of the cited references discloses a sidewall of the opening of the photoresist film having hydrophilicity and affinity increased upward, as well as a reaction of a chemical liquid with the photoresist film having such an opening. Thus, even a combination of the cited references does not make the present invention.

(3) Claim 4, 6 and 7 were rejected under 35 U.S.C. §103(a) as being unpatentable over Ishibashi et al. (JP 10-073927A) in view of Yang et al.

Ishibashi et al. disclose that the resist pattern 1a is crosslinked with the resist 2 containing a material crosslinked in the presence of acid to form the crosslinked layer 4 (see, e.g., Fig. 2). The Examiner states that Ishibashi et al. disclose a semiconductor manufacturing process wherein a first resist film containing a first base resin is formed; and a second resist film containing a second base resin is formed on the first resist pattern. However, Ishibashi's resist 2 is

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crosslinked with the resist pattern 1a in order to form the resist pattern 2a. No chemical liquids are reacted with the resists 1 and 2 to swell the resist pattern 1a or 2a. In Ishibashi et al., it is unnecessary that the opening is formed in the resists 1 and 2. Ishibashi et al. do not teach forming a reverse-tapered photoresist film. Ishibashi et al. do not teach a photoresist film having hydrophilicity and affinity increased in the depth direction.

The Examiner states that Yang et al. teach a method of forming the opening in the second resin film (claim 8-d) and the first resin film (claim 8-a). However, Yang et al. do not teach the opening formed in the second resin film and the first resin film.

Thus, Ishibashi et al. do not teach the limitations of claims 4, 6 and 7. Claims 4, 6 and 7 are not obvious over the cited references. Reconsideration of the rejection is respectfully requested.

(3) Claims 5, 8 and 21 were rejected under 35 U.S.C. §103(a) as being unpatentable over Ishibashi et al. in view of Anda et al. (JP 11-307549A).

The same arguments as explained above are applied to this rejection. Also, Anda et al. do not teach the features of claims 5, 8 and 21. Thus, claims 5, 8 and 21 are not obvious over the cited references.

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(4) Claim 9 was rejected under 35 U.S.C. §103(a) as being unpatentable over Yang et al. in view of Anda et al.

As described above, the method taught by Yang et al. is completely different from the claimed method. Anda et al. also do not teach the features of claim 9. Thus, claim 9 is not obvious over the cited references.

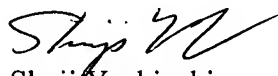
(5) In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned representative at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

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If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,
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Petition for Extension of Time




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